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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,212	04/21/2004	Qiming Li	19.0405	3211

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EXAMINER

WHITTINGTON, KENNETH

ART UNIT	PAPER NUMBER
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2862

MAIL DATE	DELIVERY MODE
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10/15/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/709,212	LI ET AL.	
	Examiner	Art Unit	
	Kenneth J. Whittington	2862	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-71 is/are pending in the application.
- 4a) Of the above claim(s) 40-71 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☒ Claim(s) 19-39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The Request for Reconsideration filed September 5, 2007 has been entered and considered.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not
7 included in this action can be found in a prior Office action.

Claims 1-8 and 10-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Fanini (US2004/0100263). Regarding claim 1, Fanini discloses method and apparatus comprising:

disposing within a borehole a logging instrument equipped with at least first transmitter and receiver antennas spaced apart by a first distance, at least one of the first antennas
14 having a tilted magnetic dipole with respect to the longitudinal axis of the instrument, the antennas being oriented about the axis of the logging instrument such that the at least one tilted magnetic dipole corresponds to a first azimuthal angle (See Fanini FIG. 1 and see paragraphs 0018, 0019 and 0044-0056, note there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z
21 directions);

azimuthally-rotating the logging instrument within the borehole and while the logging instrument is rotating,

Art Unit: 2862

activating the first transmitter antenna to transmit electromagnetic energy into the formation; while the logging instrument is rotating (See paragraphs 0062-0077),

directionally measuring the first voltage signals associated with the transmitted electromagnetic energy using the first receiver antenna, as a function of the azimuthal

7 orientation of the logging instrument, so as to determine the azimuthal variation of the measured first voltage signals (See paragraph 0056-0077); and

fitting the azimuthal variation of the measured first voltage signals to approximate functions (See paragraphs 0067-0077).

14 Regarding claim 2, the fitting step is executed while the first voltage signals are being measured (See paragraphs 0064-0078, note that the data is fit for each azimuthal sector which is used to geo-steer, which would require real time calculations for steering).

Regarding claim 3, the fitting is stopped when convergence has been achieved (See paragraphs 0064-0077).

21 Regarding claim 4, the activating, measuring, and fitting steps are repeated to execute subsequent acquisition cycles (See paragraphs 0064-0078, note steps are repeated for each sector).

Art Unit: 2862

Regarding claims 5 and 6, the fitting functions are sinusoids defined by coupling components of the first transmitter antenna's magnetic dipole and first receiver antenna's orientation vectors and the coefficients of the fitting components are functions of earth formation parameters including at least one of resistivity of formation beds,

7 location of the logging instrument, borehole deviation, azimuth angle at the location of the logging instrument, and a combination thereof (See paragraph 0056-0077).

Regarding claim 7, the fitting coefficients include constant, sine, cosine, double angle sin and double angle cosine terms that define an iterative fitting algorithm useful for determining the azimuthal dependence of the directional

14 measurements (See paragraph 0056).

Regarding claim 8, the iterative fitting algorithm is used for selected real-time directional measurements having utility in geo-steering (See paragraphs 0064-0078).

Regarding claim 10, Li discloses the logging instrument is further equipped with second transmitter antenna and receiver antennas spaced apart by the first distance, the second

21 transmitter having a magnetic dipole whose tilt corresponds to the tilt of the first receiver antenna and the second receiver antenna having a magnetic dipole whose tilt corresponds to the

Art Unit: 2862

tilt of the first transmitter antenna such that at least one of the second antennas has a tilted magnetic dipole, the second transmitter and receiver antennas being oriented about the axis of the logging instrument such that the at least one tilted magnetic dipole corresponds to a second azimuthal angle, and further comprising the steps of (See Fanini FIG. 1 and see
7 paragraphs 0018, 0019 and 0044-0056, note there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z directions):

while the logging instrument is rotating, activating the second transmitter antenna to transmit electromagnetic energy into the formation (See paragraphs 0062-0077);

while the logging instrument is rotating, directionally
14 measuring the second voltage signals associated with the transmitted electromagnetic energy using the second receiver antenna, as a function of the azimuthal orientation of the logging instrument, so as to determine the azimuthal variation of the measured second voltage signals (See paragraph 0056-0077);

fitting the azimuthal variation of the measured second
21 voltage signals from the second receiver to approximate functions (See paragraphs 0067-0077).

Art Unit: 2862

Regarding claims 11 and 12, Li discloses the second azimuthal angle differs from the first azimuthal angle by substantially 90 degrees (See Fanini FIG. 1 and see paragraphs 0018, 0019 and 0044-0056, note there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z directions, note that the sensors are three
7 axis transmitters and receivers at orthogonal axis, x, y and z, thus the first and second angles can be chosen to be 90 degrees relative to the tool axis, i.e., the x and y axes).

Regarding claim 13, Li discloses the fitting step is executed while the second voltage signals are being measured (See paragraphs 0067-0077).

Regarding claim 14, Li discloses the step of stopping the
14 fitting when convergence criterion has been achieved (See paragraphs 0067-0077).

Regarding claim 15, Li discloses the activating, measuring, and fitting steps are repeated to execute subsequent acquisition cycles (See paragraphs 0064-0078, note steps are repeated for each sector).

Regarding claim 16, Li discloses the fitting functions are
21 sinusoids defined by coupling components of the first transmitter antenna's magnetic dipoles and first receiver antenna's orientation vectors, and by coupling components of the

Art Unit: 2862

second transmitter antenna's magnetic dipoles and second receiver antenna's orientation vectors (See paragraph 0056-0077).

Regarding claim 17, Li discloses the coefficients of the fitting components are functions of earth formation parameters such as resistivity of formation beds, location of the logging instrument, borehole deviation, and azimuth angle at the location of the logging instrument (See paragraph 0056-0077).

Regarding claim 18, Li discloses the fitting coefficients include constant, sine, cosine, double angle sin and double angle cosine terms that define an iterative fitting algorithm useful for determining the azimuthal dependence of the directional measurements (See paragraph 0056).

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Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fanini in view of Minerbo et al. (US 6,304,086), hereinafter Minerbo. Regarding this claim, Fanini teaches the features noted above except for the use of a Fourier transform. Minerbo teaches use of a Fourier transform in induction logging applications (See Minerbo col. 5, line 57 to

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Art Unit: 2862

col. 15, line 38). It would have been obvious to use a Fourier transform in the processing of Fanini. One having ordinary skill in the art would have been motivated to do so to reduce the complexity of equations to a usable form as noted by Minerbo at col. 7, lines 45-49 and further it is well known in the art to use a Fourier transform to derive a set of equations with
7 coefficients representing desired characteristics.

Allowable Subject Matter

Claims 19-39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14 Regarding claims 19, 20, 24, 25 and 28, the prior art does not show or teach calculating the phase shift and attenuation and the calculating as recited in the claims and in combination with the other features of the claims.

 Regarding claims 21-23, the prior art does not show or teach characterizing the noise as recited in the claims and in combination with the other features of the claims.

21 Regarding claims 26 and 27, the prior art does not show or teach determining the constant and first harmonic coefficients

Art Unit: 2862

as recited in the claims and in combination with the other features of the claims.

Regarding claims 29-39, the prior art does not show or teach the particular iterative fitting algorithm as recited in the claims and in combination with the other features of the claims.

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Response to Arguments

Applicant's arguments filed September 5, 2007 have been fully considered but they are not persuasive.

The only argument asserted by Applicants is that the Fanini does not disclose tilted coils as recited in the claims. As defined in Webster's New College Dictionary (1999 Houghton Mifflin Co.), tilt is a deviation from the horizontal or vertical. It does not have provide limits on this deviation. Thus, tilt can be interpreted to mean any angle between 0 and 180 degrees from the note axis.

The specification, drawings and claims or the specific portion thereof cited by Applicants (paragraph 0012) of the present application further do not provide a specific definition of tilt foreclosing the interpretation of tilt as being perpendicular or transverse to a given axis.

With regard to Fanini, its antennas are tilted at an angle of 90 degrees to the tool axis. Accordingly, Fanini teaches the coils or antennas tilted in the manner recited in the claims. The fact that Fanini does not use the word tilt with regard to its antennas does not foreclose the interpretation the antennas are tilted.

7 For the forgoing reasons, the rejections stand.

Conclusion

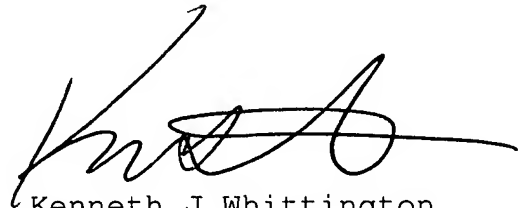
THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

14 A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, 21 however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Art Unit: 2862

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Whittington whose telephone number is (571) 272-2264. The examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

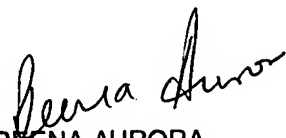
If attempts to reach the examiner by telephone are
7 unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Kenneth J Whittington
Examiner
Art Unit 2862

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kjw



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